

Chapter 7

Monitoring Program

The SDIP requires several types of monitoring programs related to ASIP conservation measures. DWR and Reclamation are responsible for implementing the SDIP ASIP monitoring plan described below. Table 7-1 identifies the types of monitoring for ASIP-covered species and natural communities. The primary purposes of this monitoring are to:

- identify the occurrences of ASIP-covered species and ASIP-covered species habitat under preproject conditions,
- ensure that ASIP-covered species are not affected by construction,
- document the implementation and effectiveness of ASIP conservation measures, and
- collect data needed to support development and implementation of more effective ASIP conservation measures.

Monitoring implementation and effectiveness of conservation measures is required as part of the environmental commitments in the project description (Chapter 2). This chapter categorizes the ASIP conservation measures identified for ASIP-covered species and natural communities (described in Chapters 4 and 5) into one of five monitoring types. Where applicable, the chapter describes the required monitoring, including:

- intent and key components of required monitoring,
- minimum analysis of monitoring data,
- monitoring schedule,
- process for reporting monitoring results and analysis, and
- process for integrating monitoring results into the CALFED monitoring program.

7.1 Types of Monitoring

The two types of monitoring outlined in this plan are intended to provide DWR and Reclamation with information for specific uses.

- Compliance monitoring is intended to track compliance with SDIP permit requirements.

- Effectiveness monitoring, as identified in Chapter 8, “Changed Circumstances, Remedial Measures, and Adaptive Management,” is intended to document the success of the SDIP relative to landscape, natural community, and species goals and objectives.

Monitoring will provide the information necessary to manage implementation of the SDIP and associated conservation measures and help ensure attainment of SDIP-desired biological outcomes. The two types of monitoring are described below.

7.2 Compliance Monitoring

Compliance monitoring assesses consistency with the terms and conditions of the SDIP permits. The types of compliance monitoring are described in the following sections.

7.2.1 Preconstruction Surveys

Preconstruction surveys will be conducted before implementation of ASIP-covered activities and SDIP conservation measures that have footprint impacts. DWR and Reclamation will be responsible for implementing conservation measures related to performing preconstruction surveys in and adjacent to the footprint of covered activities and SDIP conservation measures to determine whether covered species are, or could be, present and affected. The purpose of preconstruction surveys is to avoid or minimize construction-related impacts on covered species. All preconstruction monitoring will be conducted by qualified biologists.

Survey results will be used to determine site-specific SDIP conservation measures that will need to be implemented to avoid, minimize, and mitigate impacts on ASIP-covered species and natural communities. For example, preconstruction surveys for Swainson’s hawk (i.e., Mitigation Measure SWHA1—Conduct Preconstruction Surveys to Locate Swainson’s Hawk Nest Sites) will be used to determine whether nesting or roosting Swainson’s hawks occur in or adjacent to the project footprint. If they are present, the other mitigation measures related to Swainson’s hawks (i.e., Mitigation Measure SWHA2—Minimize Construction-Related Disturbances within ½-Mile of Active Nest Sites; Mitigation Measure SWHA3—Avoid Removal of Occupied Nest Sites; Mitigation Measure SWHA4—Replace Lost Foraging and Nesting Habitat) will be implemented. If Swainson’s hawks nests are not observed during preconstruction surveys, the additional conservation measures listed above will not need to be implemented.

The SDIP mitigation measures related to preconstruction surveys for ASIP-covered species and natural communities are identified in Table 7-2. Preconstruction survey methods, including survey timing, for each covered

Table 7-1. Types of Monitoring Potentially Required for ASIP-Covered Species and Natural Communities

ASIP-Covered Species/Natural Communities	Compliance Monitoring			Effectiveness Monitoring ³
	Preconstruction Surveys ¹	Construction Monitoring ²	Performance Monitoring ³	
Species				
San Joaquin kit fox	X	X		
Riparian brush rabbit	na	na		
Giant garter snake	X	X		
California black rail	X	X		
Greater sandhill crane	n/a	n/a		
Swainson’s hawk	X	X		
White-tailed kite	X	X		
Central Valley spring-run Chinook salmon		X		
Sacramento River winter-run Chinook salmon		X		
Central Valley steelhead		X		
Delta smelt		X		
Green sturgeon		X		
Valley elderberry longhorn beetle	X	X	X	
Delta coyote-thistle	X	X	X	
Mason’s lilaeopsis	X	X	X	X
Natural Communities				
Tidal perennial aquatic		X	X	X
Tule and cattail tidal emergent wetland	X	X	X	X
Valley foothill riparian	X	X	X	X
Upland cropland	X	X	X	X

X = Monitoring is anticipated to be required for implementation of the conservation measure.

n/a = Not applicable.

¹ Preconstruction surveys may not be required for some conservation measures if planning surveys indicate ASIP-covered species habitats or NCCP communities are not present and would not be affected by covered activities.

² Construction monitoring may not be required for some conservation measures if results of preconstruction surveys do not identify the need for implementing avoidance and minimization measures when implementing the activity.

³ Performance and effectiveness monitoring would be required only if effects on natural communities are mitigated through the creation/restoration of habitat. Performance and effectiveness monitoring would not be required if effects on natural communities are mitigated through purchase of credits from a U.S. Fish and Wildlife Service-approved mitigation bank.

Table 7-2. Preconstruction Surveys for ASIP-Covered Species and Natural Communities

Applicable ASIP-Covered Species or Natural Community	Impact	Mitigation Measures Related to Preconstruction Surveys ¹
Federally Listed Species (USFWS responsibility)		
San Joaquin kit fox	Loss or disturbance of San Joaquin kit fox or suitable habitat as a result of gate construction and channel dredging	SJKF1—Conduct Preconstruction Surveys for San Joaquin Kit Fox
Giant garter snake	Loss of giant garter snake or suitable habitat for giant garter snake as a result of gate construction and channel dredging	GGSN1—Conduct Preconstruction Surveys for Giant Garter Snake
Delta smelt	Loss of delta smelt as a result of gate construction, gate operation, and channel dredging	DESM1—Implement Environmental Commitments
Valley elderberry longhorn beetle	Loss of valley elderberry longhorn beetle as a result of gate construction and channel dredging	VELB1—Perform a Preconstruction and Postconstruction Survey for Elderberry Shrubs
Federally Listed Species (NOAA Fisheries responsibility)		
Central Valley spring-run Chinook salmon Sacramento River winter-run Chinook salmon Central Valley steelhead	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	CHSA1—Implement Environmental Commitments
Green sturgeon	Loss of green sturgeon as a result of gate construction, gate operation, and channel dredging	GRST1—Implement Environmental Commitments
English sole and starry flounder (EFH species)		None
State-Listed Species		
California black rail	Loss or disturbance of California black rail or suitable nesting habitat as a result of gate construction and channel dredging	BLRA1—Conduct Preconstruction Surveys for California Black Rail
Swainson's hawk	Loss or disturbance of Swainson's hawk nests or foraging habitat as a result of gate construction and channel dredging	SWHA1—Conduct Preconstruction Surveys to Locate Swainson's Hawk Nest Sites
White-tailed kite	Loss or disturbance of raptor nest sites as a result of gate construction and channel dredging	WTKI1—Conduct Preconstruction Surveys to Locate White-Tailed Kite Nest Sites

Table 7-2. Continued

Applicable ASIP-Covered Species or Natural Community	Impact	Mitigation Measures Related to Preconstruction Surveys ¹
Delta smelt	Loss of delta smelt as a result of gate construction, gate operation, and channel dredging	See information above under “Federally Listed Species (USFWS responsibility)”
Central Valley spring-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	See information above under “Federally Listed Species (NOAA Fisheries responsibility)”
Sacramento River winter-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	See information above under “Federally Listed Species (NOAA Fisheries responsibility)”
Delta coyote-thistle	Loss of Delta coyote-thistle as a result gate construction and channel dredging	DECT1—Conduct Preconstruction Surveys for Special-Status Plants
Mason’s lilaeopsis	Loss of Mason’s lilaeopsis stands and potential habitat as a result of gate construction, gate operation and channel dredging	MALI1—Conduct Preconstruction Surveys for ASIP-Covered Plant Species
Natural Communities		
Tidal perennial aquatic	Loss of tidal perennial aquatic habitat as a result of gate construction and channel dredging	TPAQ1—Avoid and Minimize Disturbance of Tidal Perennial Aquatic Habitat
Tule and cattail tidal emergent wetland	Loss of tule and cattail tidal emergent wetland habitat as a result of gate construction and channel dredging	TTEW1—Avoid and Minimize Disturbance of Tule and Cattail Tidal Emergent Wetland Habitat
Valley/foothill riparian community	Loss of valley foothill riparian habitat as a result of gate construction and channel dredging	VFRC1—Avoid and Minimize Disturbance of Riparian Habitat
Upland cropland	Loss of upland cropland habitat as a result of gate construction and channel dredging	UPCR1—Avoid and Minimize Disturbance of Upland Cropland Habitat
USFWS = U.S. Fish and Wildlife Service. NOAA Fisheries = National Oceanic and Atmospheric Administration, National Marine Fisheries Service. DFG = California Department of Fish and Game.		
¹ Mitigation measures related to preconstruction surveys are described in Chapters 4 and 5.		

species and natural communities are described in Chapters 4 and 5. Additional detailed preconstruction survey protocol will be developed, as appropriate, through coordination with the USFWS, NOAA Fisheries, and DFG.

7.2.2 Construction Monitoring

Construction monitoring will be conducted to monitor implementation of ASIP-covered activities and SDIP conservation measures that have footprint impacts and to ensure that the applicable avoidance and minimization conservation measures identified in this ASIP, and during preconstruction surveys, are implemented. Construction monitoring will be required if results of preconstruction surveys indicate that covered species could be affected by covered activities or implementation of SDIP conservation measures.

The implementation of ASIP-covered activities and SDIP environmental commitments will be monitored to ensure that measures required to avoid and minimize impacts on covered species are appropriately implemented. Construction monitoring of natural communities is not proposed under this ASIP. Avoidance and minimization conservation measures that are required to be implemented for covered species are listed in Table 7-3. Construction survey methods, including timing of surveys, for each covered species are described in Chapter 5.

All construction monitoring will be conducted by qualified biologists. These construction monitors will document and ensure that the responsible entity implements the required avoidance and minimization measures (e.g., protection fencing is installed around protected wetlands).

7.2.3 Performance Monitoring

Performance monitoring will be conducted for habitat created specifically for ASIP-covered species (e.g., VELB, Mason's Lilaeopsis), to confirm development of intended ecological functions and values. Information collected through performance monitoring will be used to determine whether changed circumstances exist and the need for implementing remedial measures. In addition, performance monitoring will provide information that may help improve enhancement, creation, and restoration techniques.

Performance indicators are the variables that will be quantitatively measured over time to determine whether enhanced, created, or restored habitats have successfully met the project's biological goals and objectives (Table 7-4). Success criteria established for each performance indicator are the minimum requirements needed to achieve biological goals and objectives. Achieving the success criteria indicates that the mitigation measures have successfully replaced the functions and values of the natural communities affected by covered activities. Remedial measures described in Chapter 8, "Changed Circumstances,

Remedial Measures, and Adaptive Management,” must be implemented if the success criteria are not achieved within the performance period indicated for each applicable conservation measure.

Performance monitoring will be conducted by qualified biologists and ecologists. Detailed monitoring protocol will be developed through coordination with the USFWS, NOAA Fisheries, and DFG.

7.3 Effectiveness Monitoring

Effectiveness monitoring will be conducted to:

- determine the response of the species to SDIP conservation measures,
- determine the response of natural communities to management, and
- provide information that can be used to evaluate the efficacy of natural community enhancement, creation, or restoration relative to achievement of SDIP conservation measure goals and objectives.

Effectiveness monitoring for ASIP-covered fish species is covered under OCAP. Additional effectiveness monitoring for covered fish species will not be required under the SDIP.

With implementation of conservation measures, DWR and Reclamation will coordinate with USFWS, NOAA Fisheries, and DFG to identify science-based survey methods and schedules for monitoring the effectiveness of conservation measures, including establishing baseline conditions before implementation. Performance standards are not associated with effectiveness monitoring. The results of effectiveness monitoring are interpreted relative to the level of an expected species response. Chapter 8, “Changed Circumstances, Remedial Measures, and Adaptive Management,” includes a discussion of effectiveness monitoring and potential changes in conservation measures through the adaptive management process in future years.

7.4 Reporting

DWR and Reclamation will prepare annual monitoring reports. The annual monitoring reports summarize the previous calendar year’s monitoring results and will be completed by February 15 of the year following monitoring activities. Reports will be submitted to the California Bay-Delta Authority (CBDA) and the resource agencies.

Monitoring reports will include:

- a description of ASIP-covered activities implemented during the reporting period;

Table 7-3. Avoidance and Minimization Measures for ASIP-Covered Species

Applicable ASIP-Covered Species or Natural Community	Impact	Mitigation Measure to Avoid and Minimize Impacts ¹
Federally Listed Species (USFWS responsibility)		
San Joaquin kit fox	Loss or disturbance of San Joaquin kit fox or suitable habitat as a result of gate construction and channel dredging	SJKF2—Minimize Construction-Related Disturbances Near Active Den Sites
Giant garter snake	Loss of giant garter snake or suitable habitat for giant garter snake as a result of gate construction and channel dredging	GGSN2—Minimize Construction-Related Disturbances in the Vicinity of Occupied Habitat
Delta smelt	Loss of delta smelt as a result of gate construction, gate operation, and channel dredging	DESM1—Implement Environmental Commitments
Valley elderberry longhorn beetle	Loss of valley elderberry longhorn beetle as a result of gate construction and channel dredging	VELB2—Avoid and Minimize Impacts on Elderberry Shrubs
Federally Listed Species (NOAA Fisheries responsibility)		
Central Valley spring-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	CHSA1—Implement Environmental Commitments
Sacramento River winter-run Chinook salmon		
Central Valley steelhead		
Green sturgeon	Loss of green sturgeon as a result of gate construction, gate operation, and channel dredging	GRST1—Implement Environmental Commitments
English sole and starry flounder (EFH species)		None
State-Listed Species (DFG responsibility)		
California black rail	Loss or disturbance of California black rail or suitable nesting habitat as a result of gate construction and channel dredging	BLRA2—Minimize Construction-Related Disturbances in the Vicinity of Active Nest Sites BLRA3—Avoid Removal of Breeding Habitat During the Nesting Season
Swainson's hawk	Loss or disturbance of Swainson's hawk nests or foraging habitat as a result of gate construction and channel dredging	SWHA2—Minimize Construction-Related Disturbances within ½ Mile of Active Nest Sites SWHA3—Avoid removal of Occupied Nest Sites

Table 7-3. Continued

Applicable ASIP-Covered Species or Natural Community	Impact	Mitigation Measure to Avoid and Minimize Impacts ¹
White-tailed kite	Loss or disturbance of raptor nest sites as a result of gate construction and channel dredging	WTKI2—Minimize Construction-Related Disturbances within ¼ Mile of Active Nest Sites WTKI3—Avoid Removal of Occupied Nest Sites
Delta smelt	Loss of delta smelt as a result of gate construction, gate operation, and channel dredging	See information above under “Federally Listed Species (USFWS responsibility)”
Central Valley spring-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	See information above under “Federally Listed Species (NOAA Fisheries responsibility)”
Sacramento River winter-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	See information above under “Federally Listed Species (NOAA Fisheries responsibility)”
Delta coyote-thistle	Loss of Delta coyote-thistle as a result gate construction and channel dredging	DECT2—Avoid and Minimize Impacts on Delta Coyote-Thistle
Mason’s lilaeopsis	Loss of Mason’s lilaeopsis stands and potential habitat as a result of gate construction, gate operation and channel dredging	MALI2—Map Tidal Mudflat Habitat in the Project Area MALI3—Avoid and Minimize Impacts on Mason’s Lilaeopsis
Natural Communities		
Tidal perennial aquatic	Loss of tidal perennial aquatic habitat as a result of gate construction and channel dredging	TPAQ1—Avoid and Minimize Disturbance of Tidal Perennial Aquatic Habitat
Tule and cattail tidal emergent wetland	Loss of tule and cattail tidal emergent wetland habitat as a result of gate construction and channel dredging	TTEW1—Avoid and Minimize Disturbance of Tule and Cattail Tidal Emergent Wetland Habitat
Valley/foothill riparian community	Loss of valley foothill riparian habitat as a result of gate construction and channel dredging	VFRC1—Avoid and Minimize Disturbance of Riparian Habitat
Upland cropland	Loss of upland cropland habitat as a result of gate construction and channel dredging	UPCR1—Avoid and Minimize Disturbance of Upland Cropland Habitat
USFWS	= U.S. Fish and Wildlife Service.	
NOAA Fisheries	= National Oceanic and Atmospheric Administration, National Marine Fisheries Service.	
DFG	= California Department of Fish and Game.	
¹ Mitigation measures related to avoidance and minimization measures are described in Chapters 4 and 5.		

Table 7-4. Performance Monitoring Indicators and Success Criteria for Mitigation Measures

Mitigation Measure ¹	Performance Period	Performance Indicators	Success Criteria ³
ASIP-Covered Species			
VELB3—Compensate for Unavoidable Impacts on Elderberry Shrubs ²	10 years following implementation of the conservation measure	Percentage survival of transplanted shrubs Percentage survival of elderberry seedlings Percentage survival of associated native plant seedlings	60% (all indicators)
MALI4—Compensate for Loss of Mason’s Lilaeopsis	To be determined in consultation with the resource agencies	Acreage created, restored, or enhanced	To be determined in consultation with the resource agencies
MALI5—Monitor Existing Stands of Mason’s Lilaeopsis during the Gate Operations Phase	5 years following implementation of conservation measure	DWR and Reclamation will annually monitor the extent and condition of the Mason’s lilaeopsis populations identified during preconstruction surveys within 0.5-mile upstream of the gates	To be determined in consultation with the resource agencies
ASIP-Covered Natural Communities			
TPAQ2—Compensate for Loss of Tidal Perennial Aquatic Habitat	Within 30 days following end of construction	Acreage created, restored, or enhanced	To be determined in consultation with the resource agencies
TTEW2—Compensate for Loss of Tule and Cattail Tidal Emergent Wetland Habitat	5 years following implementation of conservation measure	Acreage created, restored, or enhanced Percentage of absolute cover by emergent vegetation Percentage of relative cover by native wetland vegetation Presence of wetland hydrology	To be determined in consultation with the resource agencies
TTEW3—Monitor Existing Stands of Tidal Emergent Wetland Vegetation during the Gate Operations Phase	5 years following construction of gate	Monitor the extent and condition of existing tidal emergent wetland for a distance of 0.5 mile upstream of the Grant Line Canal gate for a 5-year period after the gate is constructed	To be determined in consultation with the resource agencies
VFRC2—Compensate for Temporary and Permanent Loss of Riparian Habitats	5 years following implementation of conservation measure	Acreage created, restored, or enhanced Percentage of relative native tree canopy cover Percentage of relative native shrub cover	To be determined in consultation with the resource agencies
UPCR2—Compensate for the Loss of Upland Cropland Habitat	Within 30 days following end of construction	Acreage created, restored, or enhanced	Restoration of upland cropland to preproject conditions

¹ Mitigation measures related to performance monitoring are described in Chapters 4 and 5.

² California Department of Water Resources will take special precautions to ensure that elderberry shrubs are not affected by dredging or other activities. Although no effects are anticipated at this time, elderberry shrubs and associated habitat could be inadvertently damaged by channel dredging activities.

³ Success criteria will be determined in coordination with the resource agencies.

- a description of habitat protection, enhancement, and restoration conservation measures implemented during the reporting period;
- a year-to-date summary of the extent of protected, enhanced, and restored habitat;
- a summary of impacts of ASIP-covered activities and conservation measures on covered species and natural communities;
- a description of avoidance, minimization, and mitigation conservation measures implemented to address impacts of ASIP-covered activities and conservation measures;
- a description of performance monitoring undertaken during the reporting period, an analysis of monitoring results, and a description of remedial actions undertaken during the reporting period;
- a description of effectiveness monitoring undertaken during the reporting period and analysis of monitoring results;
- an assessment of the efficacy of the monitoring program and recommended changes to the program, based on interpretation of monitoring results and research findings;
- an assessment of the efficacy of habitat enhancement and restoration methods in achieving performance objectives and recommended changes to improve the efficacy of enhancement and restoration methods;
- an assessment of the appropriateness of performance indicators and objectives, based on results of performance monitoring, and recommended changes to performance indicators and objectives; and
- recommendations for modifying and improving the efficacy of conservation measures.

7.5 Management and Monitoring of Conservation Easements for ASIP-Covered Species

Management plans will be developed for those ASIP-covered species for which agricultural lands or other land cover types will be set aside and actively managed for one or more species (e.g., Swainson's hawk). Specific management and monitoring actions will be developed for each conservation area in coordination with the appropriate resource agencies.

7.6 Environmental Enhancements

As described in Chapter 2, "Project Description," DWR will implement several environmental enhancements under the SDIP. Environmental enhancements are those actions that are not required to compensate for/mitigate impacts on ASIP-

covered species or natural communities but that will be implemented by DWR to provide a benefit to covered species and natural communities in or outside the study area.

DWR has coordinated with DFG to identify the following environmental enhancement projects:

- purchase habitat on the Feather River to protect existing bank swallow habitats and
- purchase land in the South Delta to create tidal, wetland, and riparian habitats.

In addition to these projects, DWR will fund new or ongoing surveys and investigations for fish species that may be affected by the SDIP (Table 2-5). DWR and DFG have agreed, in principal, to a funding limit of \$10 million. DWR will coordinate with DFG to determine how the funds are allocated among the various surveys and investigations.

7.7 Integrating Monitoring Results into the CALFED Monitoring Program

Monitoring of SDIP conservation measures will be developed through coordination with DWR, Reclamation, USFWS, NOAA Fisheries, and DFG. Monitoring results will be reported back to the CBDA for tracking compliance of CALFED projects with the ESA, CESA, and NCCPA. Monitoring results will also provide information to improve habitat restoration and protection methods for other CALFED projects.